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U1S S1914 S2053

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INT CL[4] F16B, G02B
Online databases: WPI

(54) Precision kinematic adjustable mount

(57) The mount for electronic or optical elements is usable to provide independent adjustment of the position of the element relative to body 10 along axes *x, y, z*. A plane within a holder 11 contains the operating face of the element, its centroid D, six points of contact x_1, x_2, x_3, y_1, z_1, z_2 engaged with adjusting screws set obliquely to the locating faces and tension force T or compression force c. The holder is held onto the screws by tension springs acting obliquely. Figures 4-8 illustrate various screw arrangements e.g. giving line contact with holder 11.

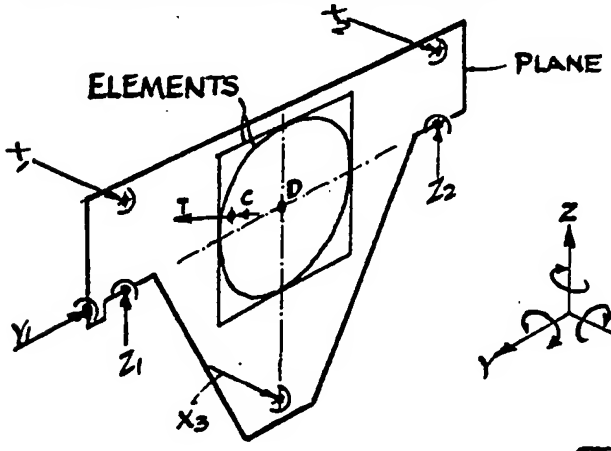

FIG. 1

FIG. 2

FIG. 3

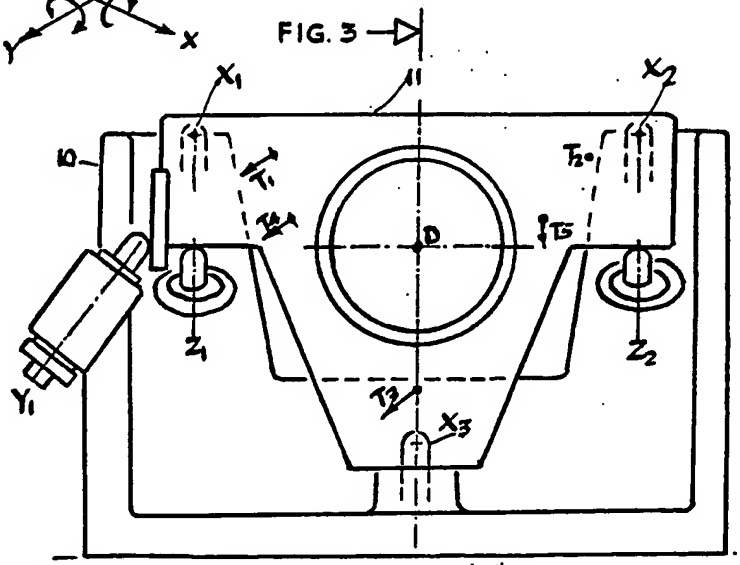

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FIG. 1

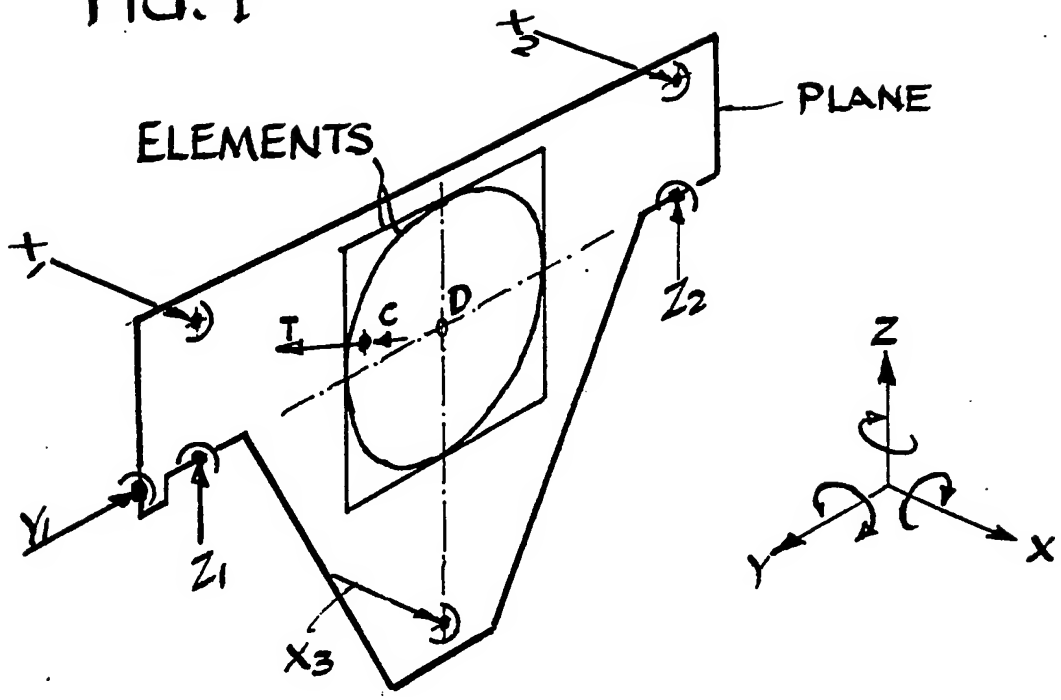


FIG. 3

FIG. 2

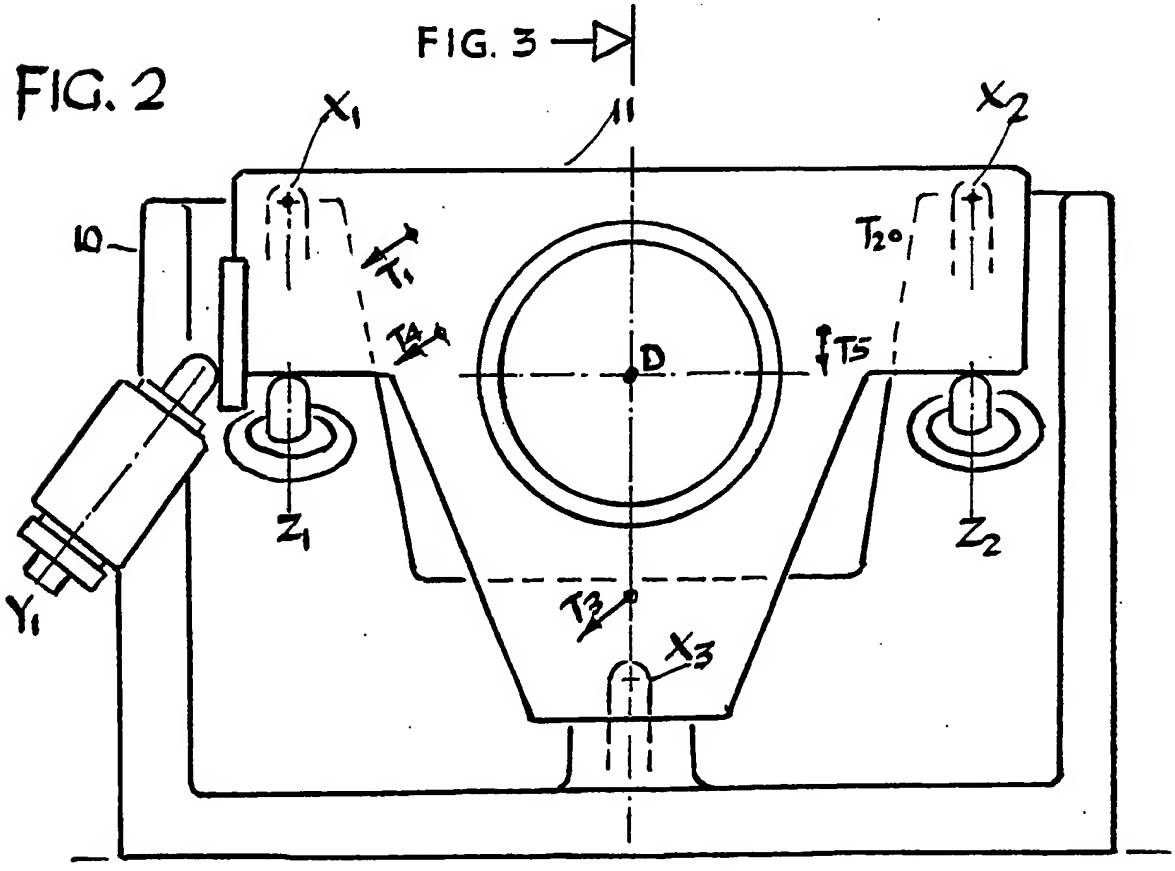


FIG 3

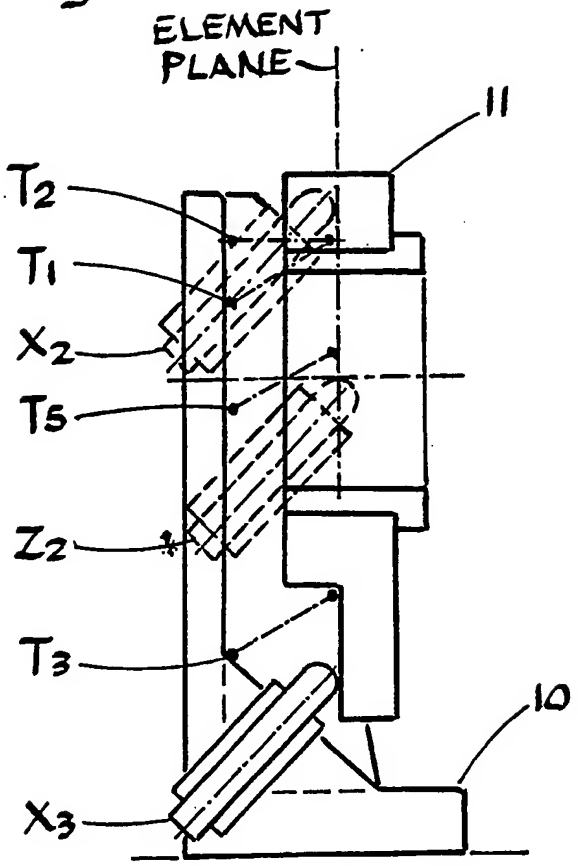


FIG 4

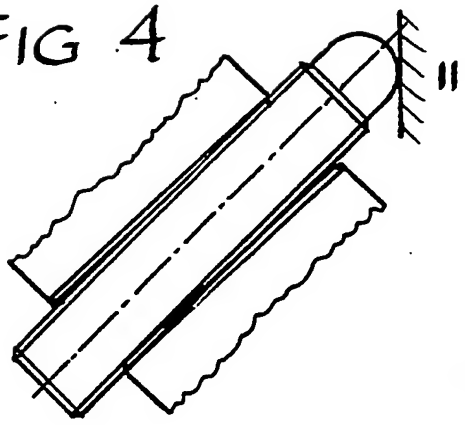


FIG 6

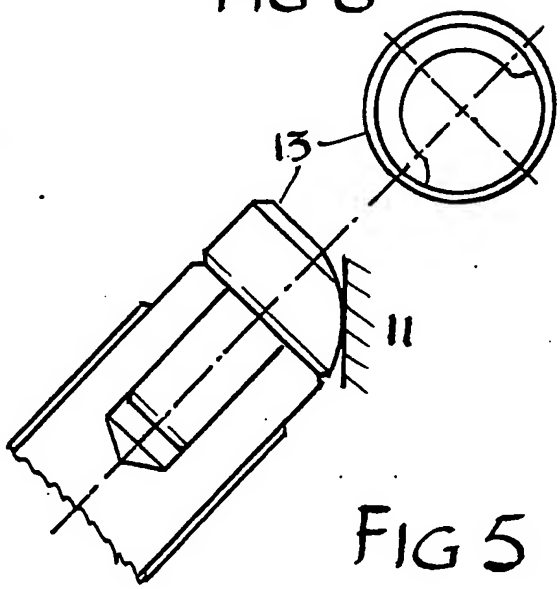


FIG 5

FIG 7

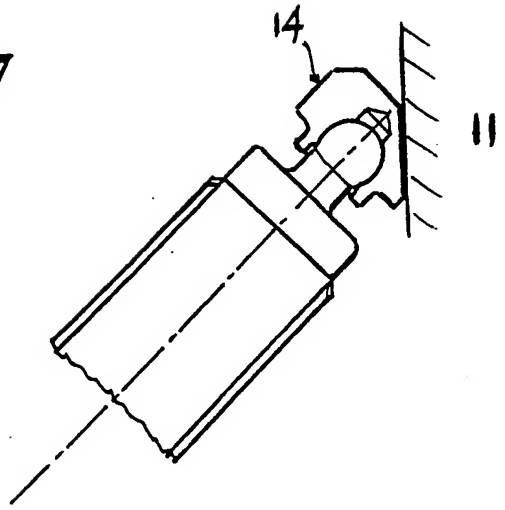
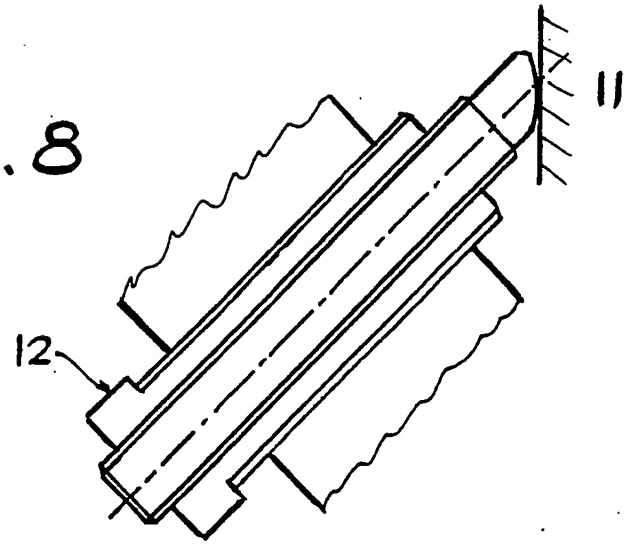


FIG. 8



PRECISION KINEMATIC ADJUSTABLE MOUNT

This invention applies to a Precision Kinematic Adjustable Mount.

Objects of the Invention

1. To provide precise complete kinematic location defined by the cartesian axes x, y, z of electronic or optical elements relative to a body 10 or frame by a simple compact mechanism.

2. To provide independent adjustment of position of the operating faces or critical planes of the elements relative to the body 10 along the axes x, y, z to 0.1 microns and rotationally about the same axes to 1 x 10^{-6} radians sensitiveness of movements.

3. The mount to be insignificantly affected by orientation in space, gravity, shock forces and temperature variations.

DESCRIPTION

Refer to Figs 1, 2, 3, 4, 5, 6, 7 & 8

1. Fig 1 shows the plane which contains the operating face of the element or its critical plane, centroid D, the six points of contact locating the holder 11 at x_1, x_2, x_3, y_1, z_1, z_2 and the tension force T or the Compression force C holding the holder 11 onto the locating faces at p by its oblique direction.

2. Fig 2 & 3 shows one embodiment of Fig 1; the elements are held in a holder 11 located on the points of adjusting screws acting as x_1, x_2, x_3, y_1, z_1, z_2. The screws are in screw holes part of the body 10 but free to turn for adjustment. Each screw in oblique to the plane. Tension T is placed and directed to hold the holder 11 onto the locator screws but also to overcome friction when adjustment causes sliding. The single force T can be replaced by separate forces T_1, T_2, T_3 or T_4 T_5 for the sake of unobtructured through transmission. The elements can be inserted and be located to the Holder 11 on either side of the said operating plane. Adjusting screws x_1, x_2, x_3 can be angled in other directions for convenience of constuction.

3. Fig 4 shows the screws forced by oblique action to contact the mating screw hole diagonally for two short lengths this elminates wobble and backlash due to clearance. The linear movement of the holder 11 is magnified at the screw ends giving the sensitive adjustments.

4. Fig 5, 6 & 7 show details 13 and 14 at the end of adjusting screws giving line or rectangular contact for the sake of heavy forces. The screws are free to revolve about the details.13 and 14.

5. Fig 8 shows the adjusting screw within a tubular bush 12 which has screw thread engagement to the screw and the body 10 giving either coarse or very fine adjustment by differential action.

CLAIMS

1. An adjustable mount for holding an optic or electronic element in the Kinematic six degrees of freedom with independent adjustment for each of the six degrees comprising; a holder for the element having six faces to locate onto adjusting screws the contacts being nominally in a plane coincident with the operating face or principal plane of the element, the said faces are positioned, three in the said plane, two in a plane perpendicular to the said plane and intersecting the centroid of the element, one mutually perpendicular to the aforesaid planes providing location nominally radial to the centroid of the element, the said groups of three and two faces are positioned around the element. One or more tension springs set obliquely to the three axes pulling the holder onto the six adjusting screws, the mount allows elements to be inserted and operate from either side of the principal plane or through transmission.

2. An adjustable mount as Claim 1 with one or more of the said adjusting screws obliquely angled to the principal plane so that contact to the locating faces is offset to their axes causing engagement on diagonally opposite segments to their mating holes in the body.

3. An adjustable mount as Claim 1 or Claim 2 with detail parts in which the screws can turn having line or oblong areas of contact onto the holder.

4. An adjustable mount as Claim 1 or Claim 2 or Claim 3 with differential screws providing the adjustments.

5. An adjustable mount substantially as described herein with reference to Figures 2 and 3 using either Figures 4 - 8 of the accompanying drawing.

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Selecting an Optical Mount

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The mounts listed here are primarily intended for holding and adjusting mirrors, beamsplitters, lenses and other round, thin optics. Newport offers an extensive array of such products, from inexpensive, fixed mounts to sophisticated five axis adjustable units. In order to select the optimum product for your application, the main factors to consider are adjustment type, transmission capability and mechanical interface.

Adjustment Type
Kinematic mounting is the most commonly used approach for providing two axis (θ_x,θ_y) rotational adjustment in optical mounts. In a kinematic mount, the center of rotation is located somewhat off the optic surface. As a result, any adjustment usually results in both angular movement and translation of the reflected/transmitted light. Furthermore, the adjustment axes are not completely independent in a kinematic mount.

Gimbal mounts imply that the center of rotation is located at the geometrical center and on the front surface of the optical component. They are typically used when even small changes in optical path length are critical. Gimbal mounts are usually more mechanically complex, and thus more costly, than kinematic mounts. For a more detailed explanation on this topic, see Introduction to Positioning Equipment.

Kinematic Adjustment

Gimbal Adjustment

Transmission Capability
Mounts with a clear aperture can be used with transmissive components such as beamsplitters, filters and lenses. Platform style mounts have solid front plate and can be used with reflective optics and as tilt platforms for components mounted to the surface, such as prisms and beamsplitter cubes.

Mechanical Interface
Newport offers optical mounts which interface with our post mounting, rod mounting, optical rail, linear stage and optical table systems.

Kinematic Mounts
ULTIMA® Series: *(Part numbers beginning with a U)* One of our finest